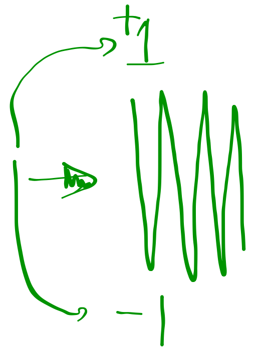
2.2/25

consider $\lim_{x\to 0^+} \sin\left(\frac{1}{x}\right)$

$\sin(\sim)$ →



$\frac{1}{x} = 0 \Rightarrow x =$ does not exist

$\sin(\sim) = 0$

when

$\sim = 0 \pm n\pi$

$= \pm n\pi$

$0, \pi, 2\pi, 3\pi, 4\pi, \ldots$

$\frac{1}{x} = \pi \Rightarrow \frac{1}{3} \quad x = \frac{1}{\pi} \quad -\frac{\sqrt{2}}{2}$

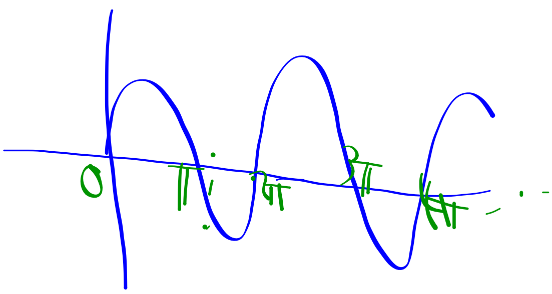
-1

$\frac{1}{x} = 2\pi \Rightarrow \frac{1}{6} \quad x = \frac{1}{2\pi}$

$+1$

$\frac{1}{x} = 3\pi \Rightarrow \frac{1}{9} \quad x = \frac{1}{3\pi}$

-1



$\frac{1}{x} = 4\pi \Rightarrow \frac{1}{12} \quad x = \frac{1}{4\pi}$

$+1$

$\frac{1}{x} = 5\pi \Rightarrow x = \frac{1}{5\pi}$

Key Idae

$\sin\left(\frac{1}{x}\right)$

A limit may not exist because the function oscillates

$\sin\left(\frac{1}{x}\right) = 1$ when

$\left(\frac{1}{x}\right) = \frac{\pi}{2} \pm 2n\pi$

$= \frac{\pi \pm 4n\pi}{2} = \frac{-3\pi}{2}, \frac{\pi}{2}, \frac{5\pi}{2}, \ldots$

$\frac{1}{x} = \frac{\pi}{2} \Rightarrow x = \frac{2}{\pi}$

$\frac{1}{x} = \frac{5\pi}{2} \Rightarrow x = \frac{2}{5\pi}$

$\frac{2}{9\pi}$

$\frac{2}{13\pi} \ldots$

$x = .1$ $\quad \frac{1}{x} = \frac{1}{.1} = 10$ $\quad \sin(10)$

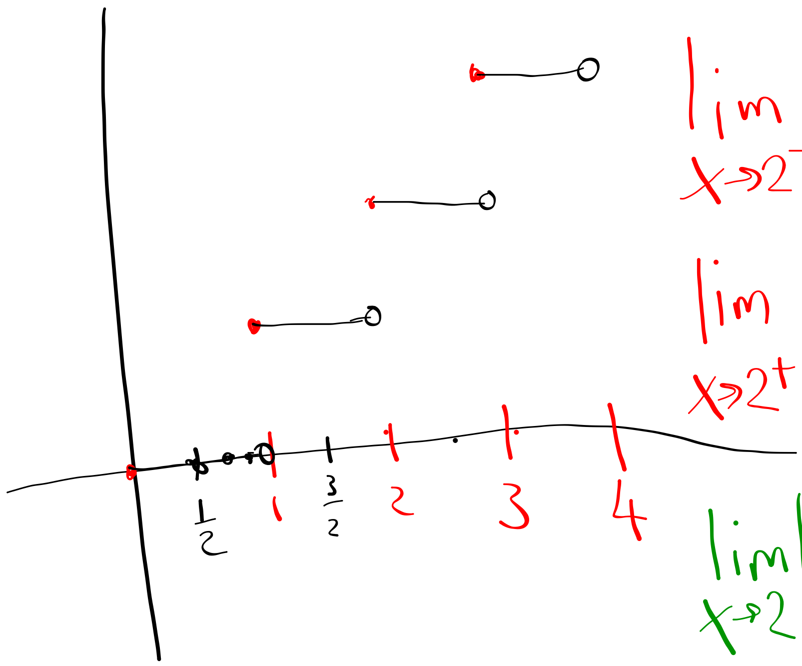
$x = .01$ $\quad \frac{1}{x} = \frac{1}{.01} = 100$ $\quad \sin(100)$

$x = .001$

To understand mathematics
you must discover it yourself.

this is a rewarding struggle,
just like life (is supposed to be)

37) $\lfloor x \rfloor$ = greatest integer less than/equal to x



$$\lim_{x \to 2^-} \lfloor x \rfloor = 1$$

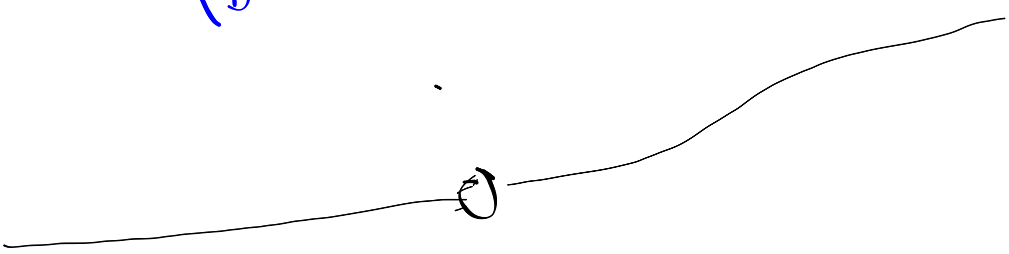
$$\lim_{x \to 2^+} \lfloor x \rfloor = 2$$

$$\lim_{x \to 2} \lfloor x \rfloor = \text{dne}$$

jump discontinuity

Key idea A limit may not exist because the function "jumps"

Key idea The limit of a function with a removable discontinuity exists (but doesn't match the value of the f^n if that exists



$$f(x) = (2x+3)\left(\frac{x-2}{x-2}\right)$$

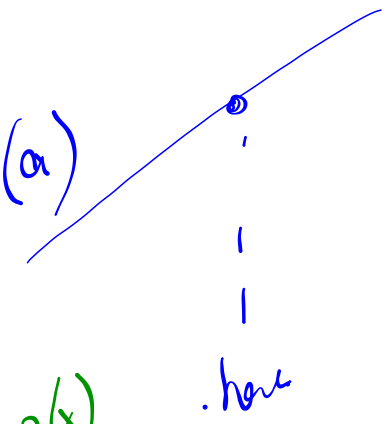
this looks exactly like $y=2x+3$

but is not defined at $x=2$

Shane

2.3/ 1-9 odd
11, 17, 25, 33, 39-51 odd

$$\lim_{x \to a} \ell(x) = \ell(a)$$



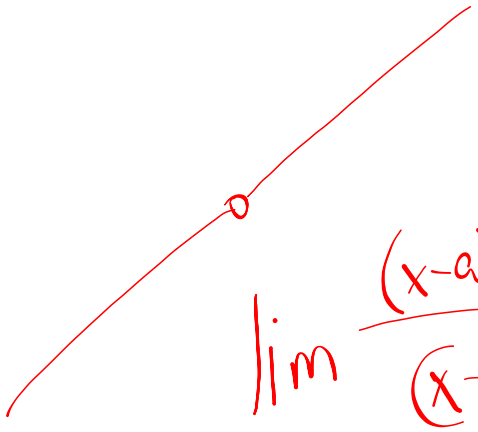
$$\lim_{x \to a} [f(x) + g(x)] = \lim_{x \to a} f(x) + \lim_{x \to a} g(x)$$

2.2/6 What are the potential problems of using a calculator to estimate

$$\lim_{x \to a} f(x)?$$

- did I look "close enough"
- did I look at points "far enough" apart
- am I "settling down" to the correct answer?
  what is the "error"?

Sep 5-8:43 AM



easy if everything looks polynomial-ish

$$\lim_{x \to a} \frac{(x-a)P(x)}{(x-a)Q(x)} = \frac{P(a)}{Q(a)}$$

Sep 5-9:02 AM